Developing a nearshore biota-indicator of chemical contaminants in Puget Sound

Jim West, Jennifer Lanksbury
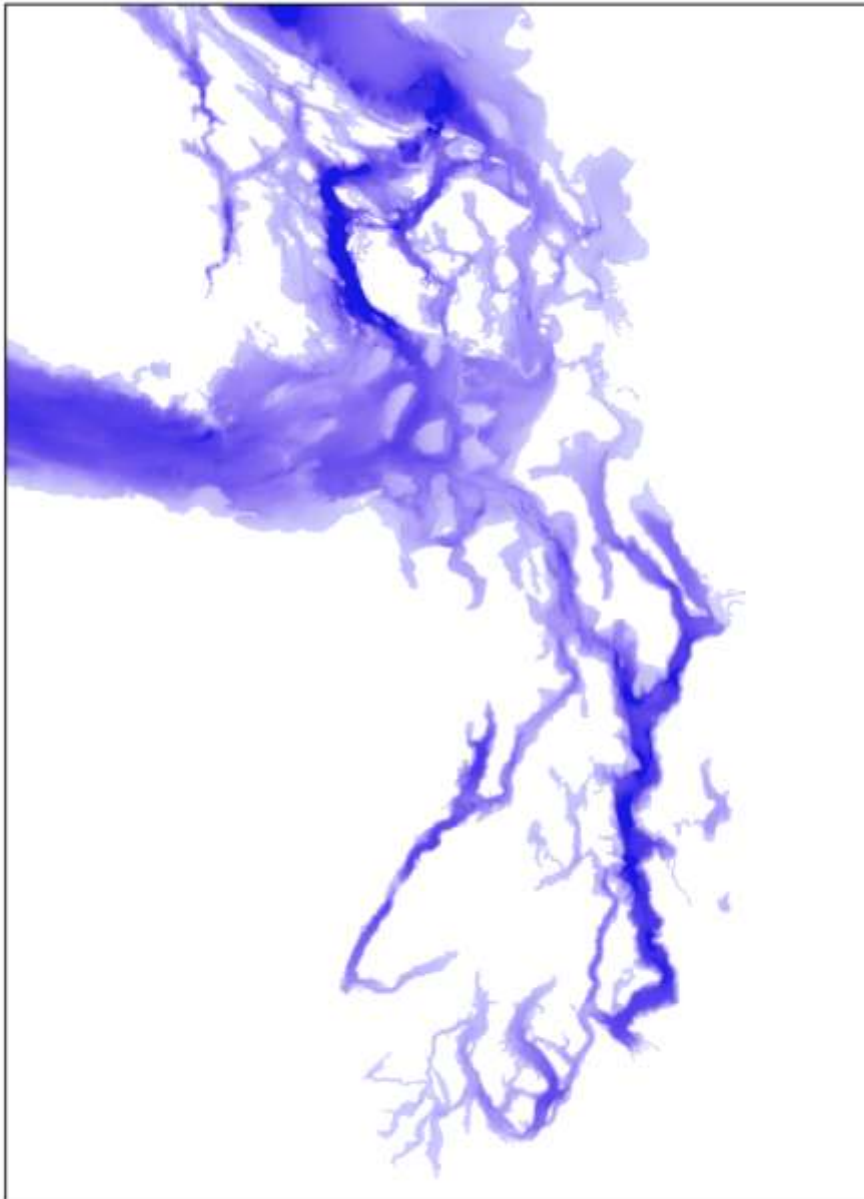
Puget Sound Assessment and Monitoring Program (PSAMP)
Washington Department of Fish and Wildlife

PSAMP
Puget Sound Assessment
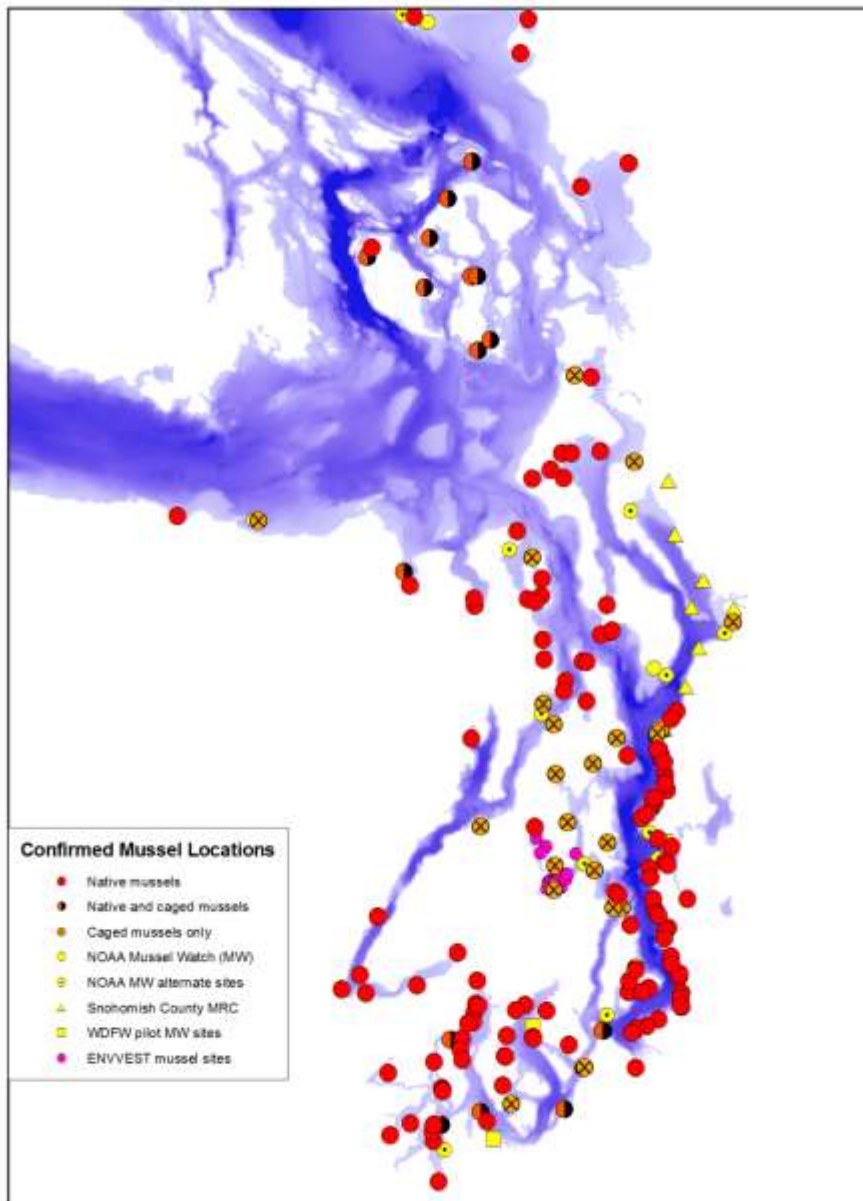and Monitoring Program

Initial questions

- Can mussels (e.g., NOAA's Mussel Watch program) be adapted to answer contaminant questions on a smaller scale?

- Can we implement a program that compares and tracks contaminants in UGA *vs* non-UGA?

- No – first we need to know
  - *do we have enough mussels in PS to support sampling?*
  - *what is the resolving power of mussels?*

Is mussel distribution sufficient to support widespread monitoring?

Confirmed Mussel Locations

- Native mussels
- Native and caged mussels
- Caged mussels only
- NOAA Mussel Watch (MW)
- NOAA MW alternate sites
- Snohomish County MRC
- WDFW pilot MW sites
- ENVVEST mussel sites

Locations confirmed:
- NOAA/DFW
- DOH
- Sno Co.
- ENVVEST
- Tribes
- Local groups

Predicted Availability of Mussels
— Present - Confirmed
— Present - Estimated
— Absent - Estimated
— Absent - Confirmed
— Not Yet Evaluated
▭▭ Present - Estimated (Patchy)
▭▭ Present - Estimated (Continuous)
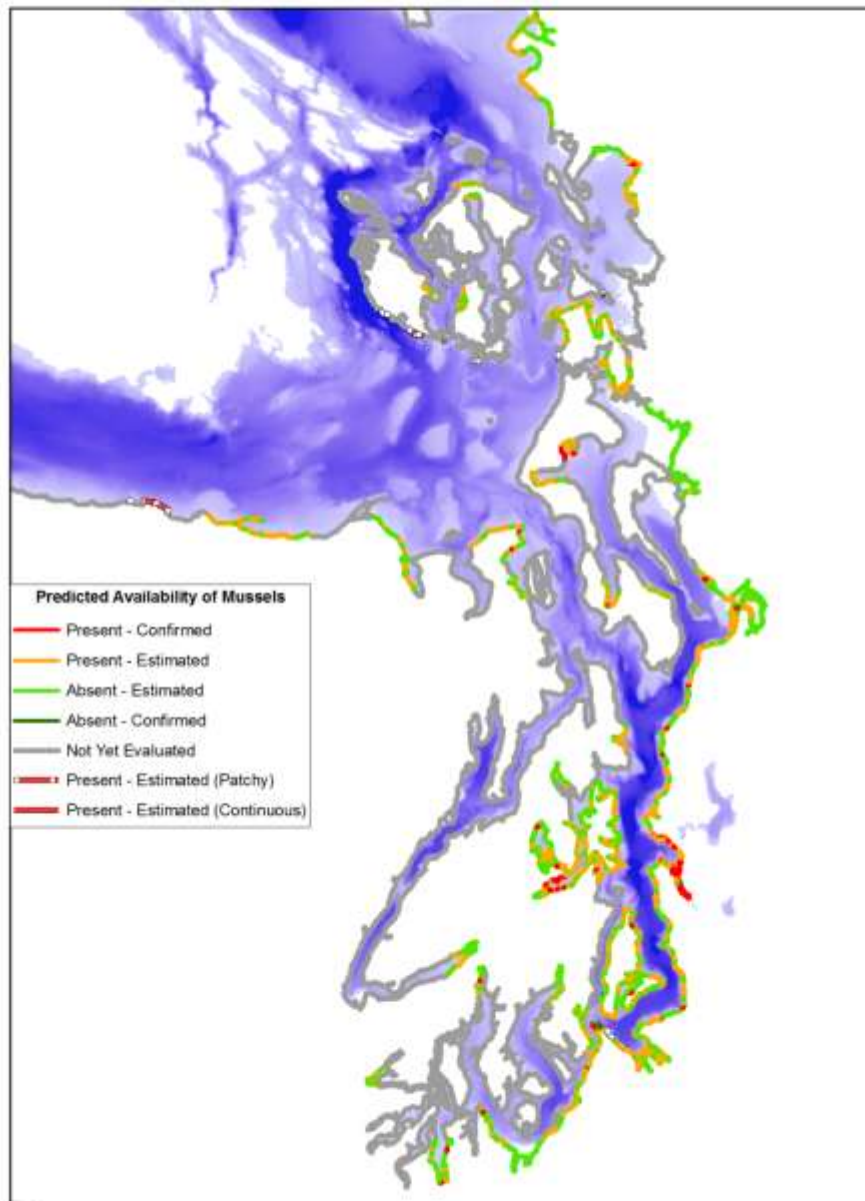
Desktop survey using….

•orthophotos

•shore zone

•Confirmed observations

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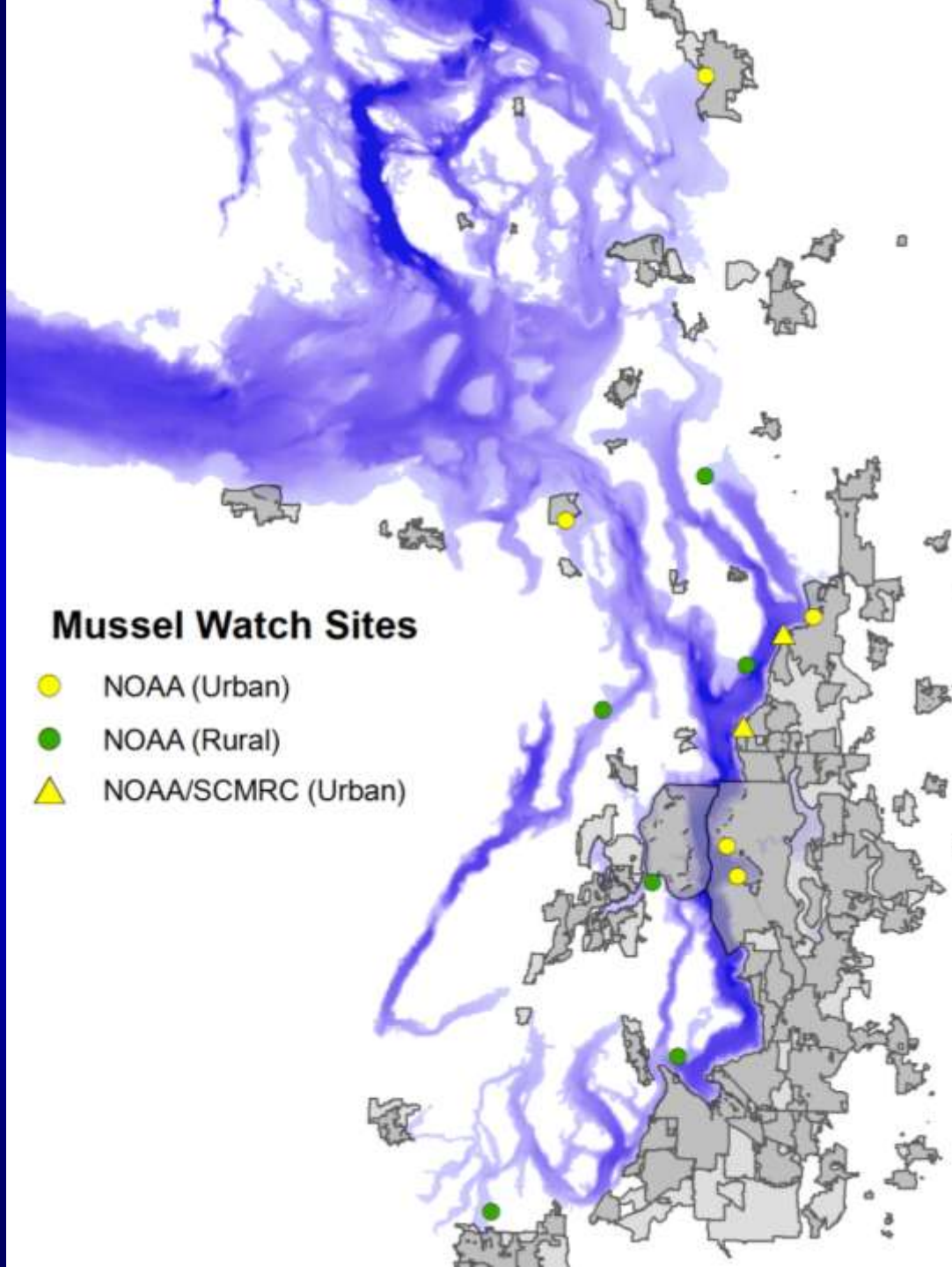- △ Snohomish County MRC
- ▢ WDFW pilot MW sites
- ● ENVVEST mussel sites

What is our ability to distinguish contaminants in mussels from UGA versus non-UGA?

(for a variety of chemicals…..)

NOAA Mussel Watch (MW)
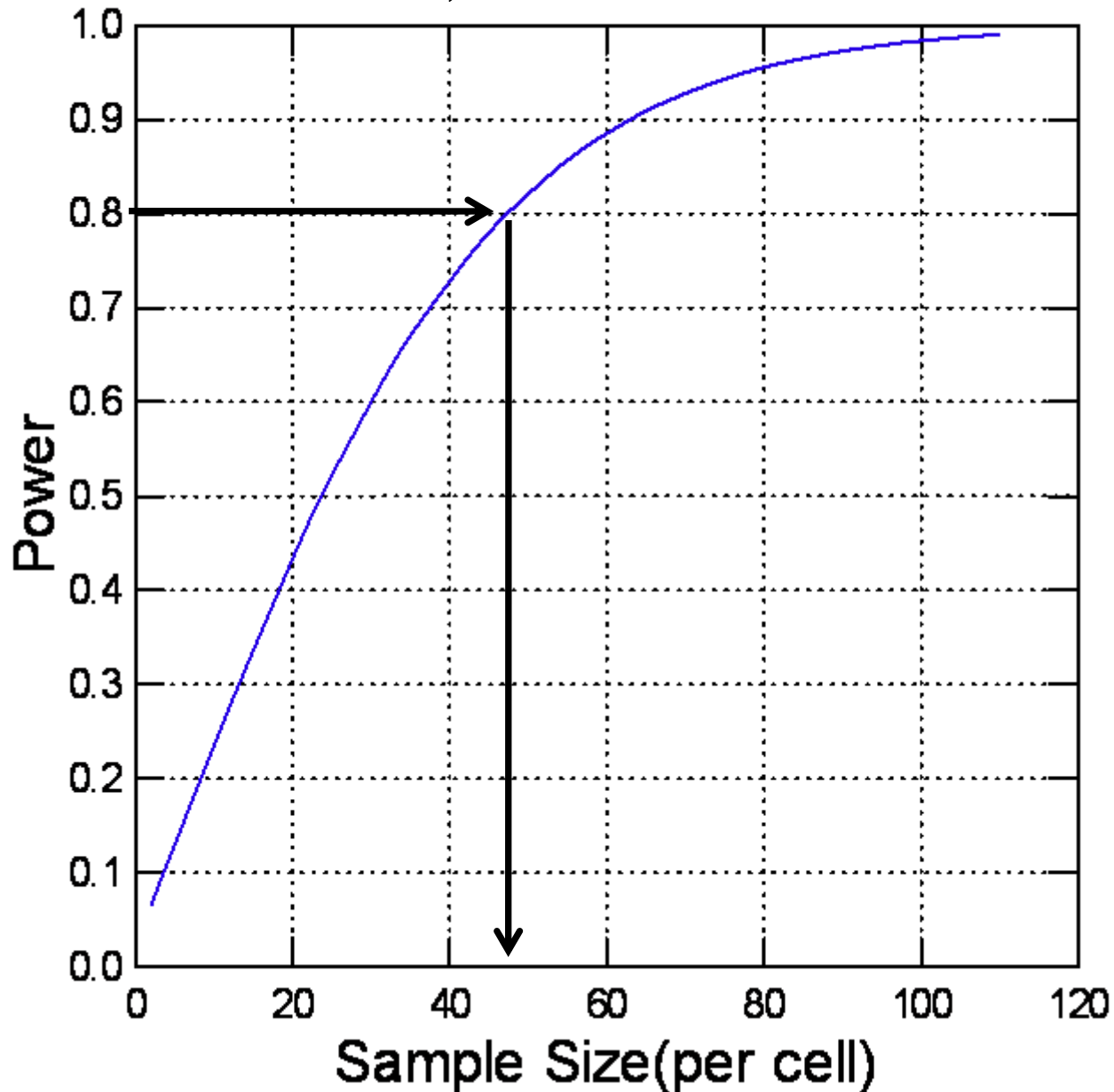
Snohomish County MRC
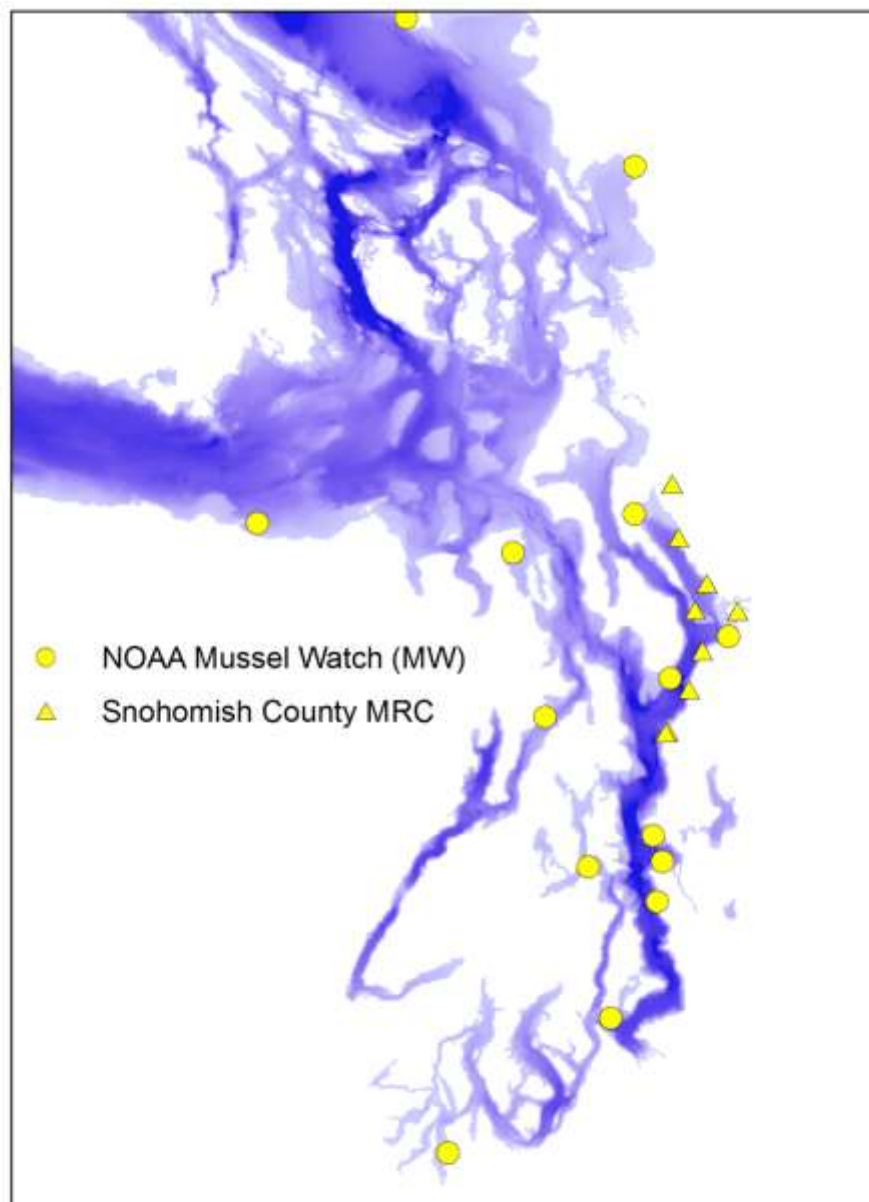
Mussel Watch Sites

- ● NOAA (Urban)
- ● NOAA (Rural)
- ▲ NOAA/SCMRC (Urban)

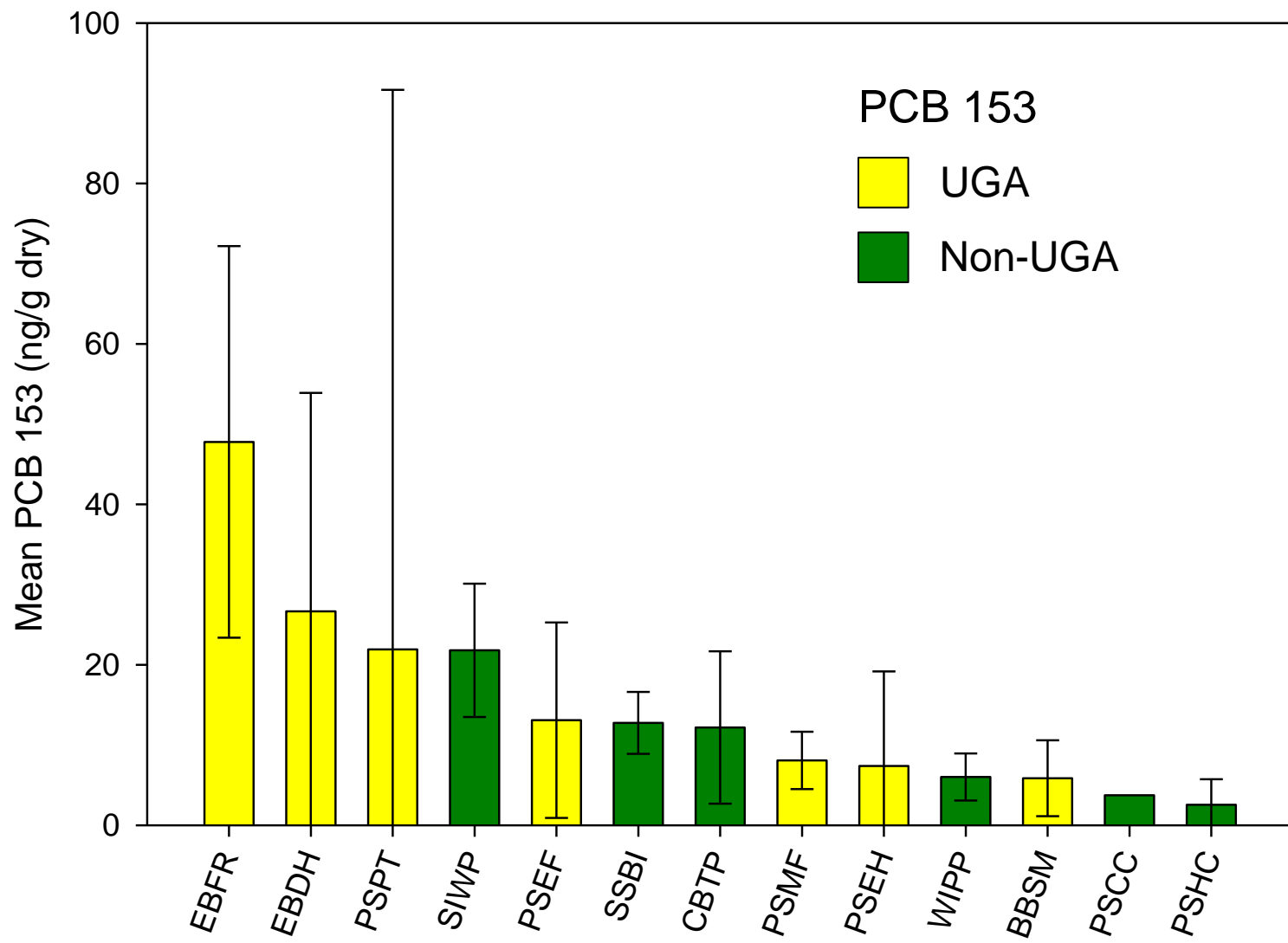# Statistical Power

- H_o of no sign. diff. between UGA and non-UGA (t test) for 4 contaminant types (PCBs, PBDEs, PAHs, Metals)

- estimate the sample size needed to identify the difference, based on known or predicted variance

PCB 153, UGA vs non-UGA

Analyte	N
PCBs	96
PBDEs	150
Phenanthrene	220
Fluoranthene	210
Mercury	104
Copper	210

National Land Cover Data (2006)

- Open Water
- Perennial Snow/Ice
- Developed open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Herbaceous
- Hay/Pasture
- Cultivated Crops
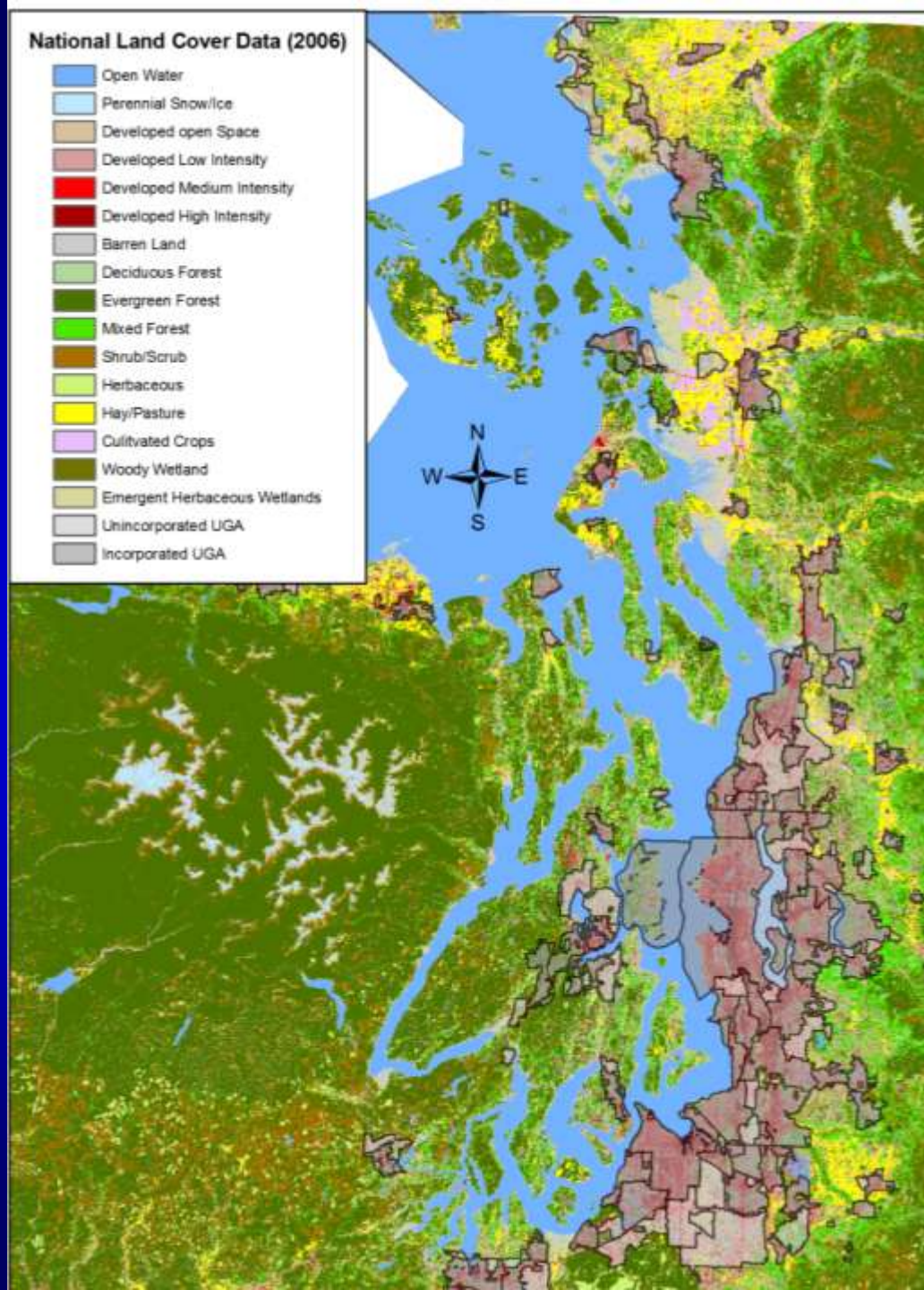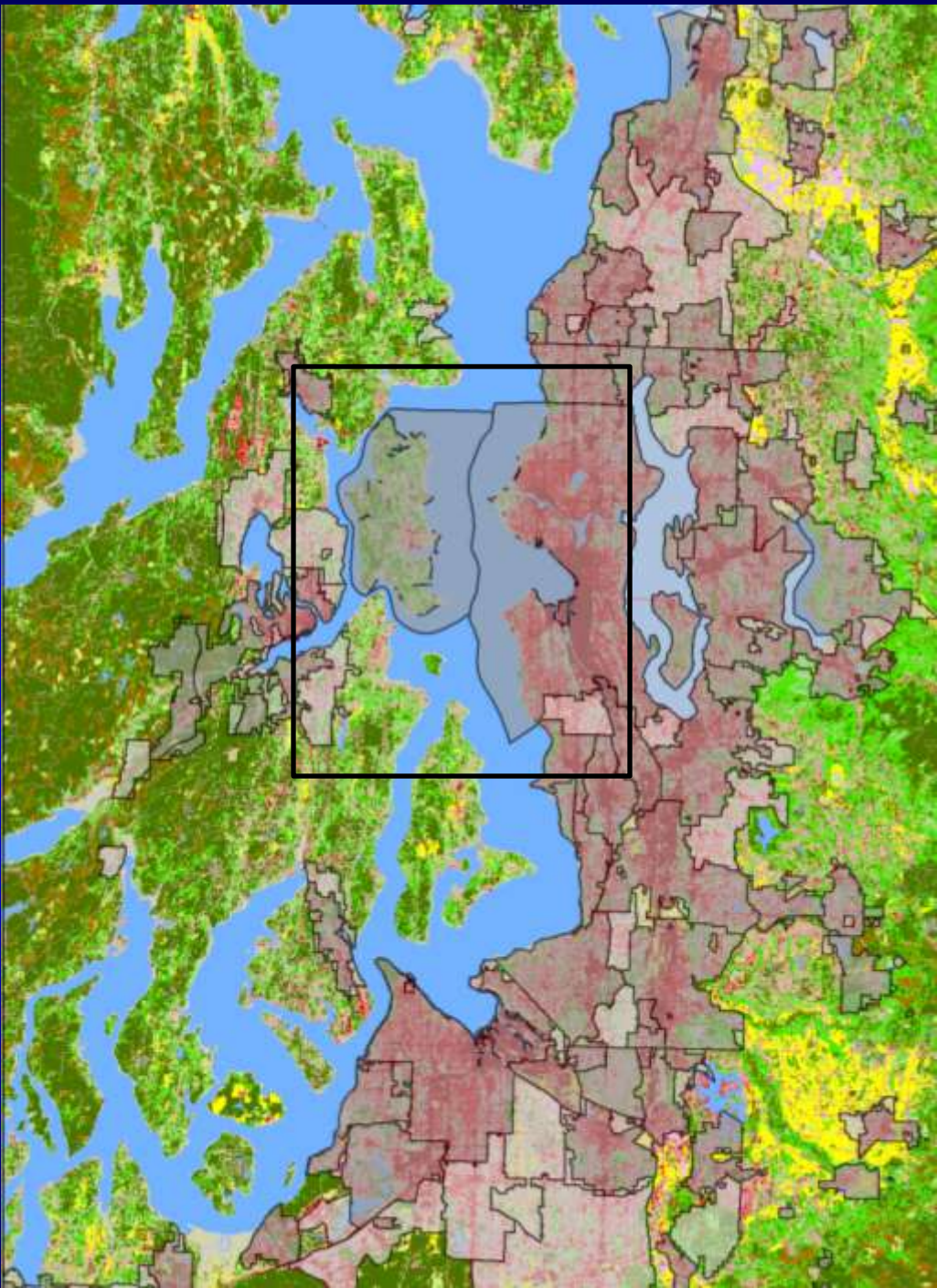- Woody Wetland
- Emergent Herbaceous Wetlands

Contaminants in mussels probably reflect a complex interaction between:

➢ watershed land-uses
  ➢degree of development
  ➢industrial *vs* residential
  ➢Amount of impervious surfaces

➢ conveyance mechanisms

➢shoreline processes
  ➢Water movement (drift cells)
  ➢conventional water quality

➢mussel biology

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	Unincorporated UGA
	Incorporated UGA

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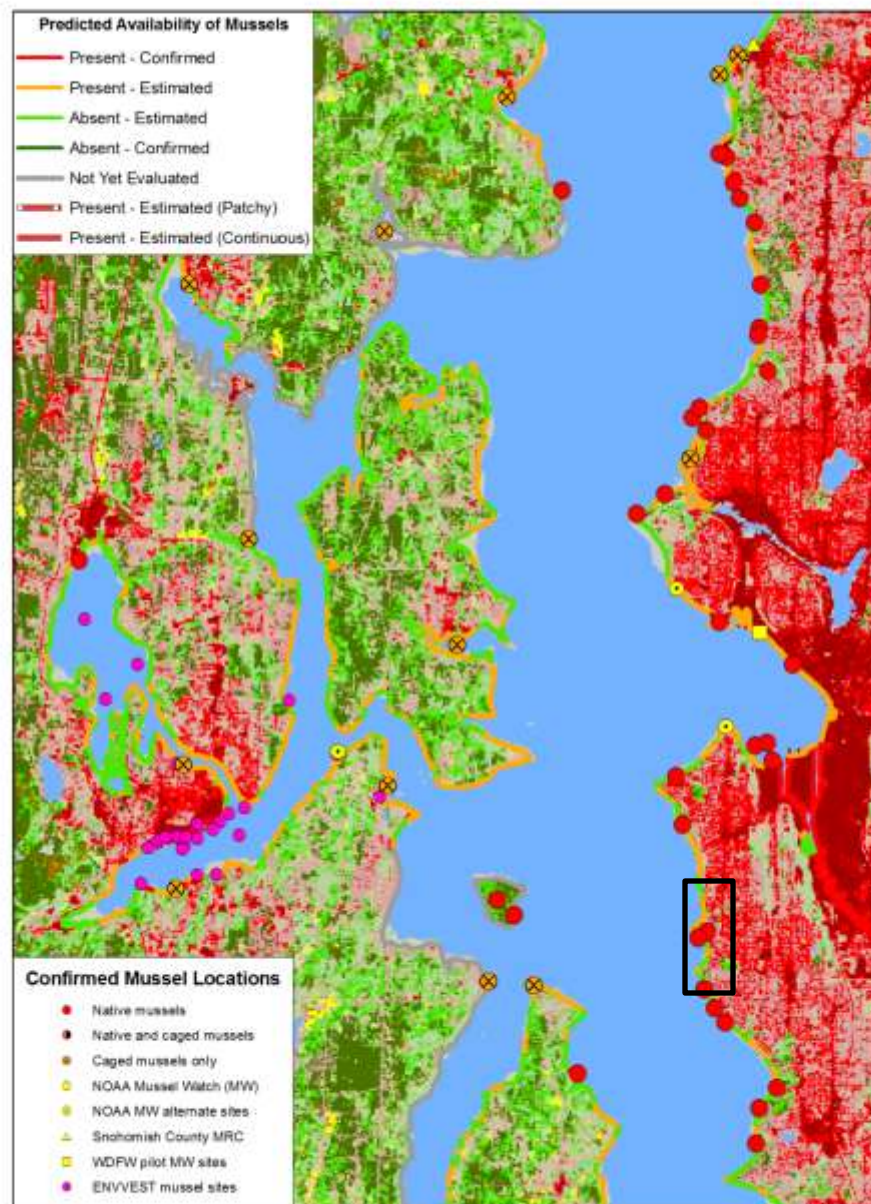- Present - Estimated (Continuous)
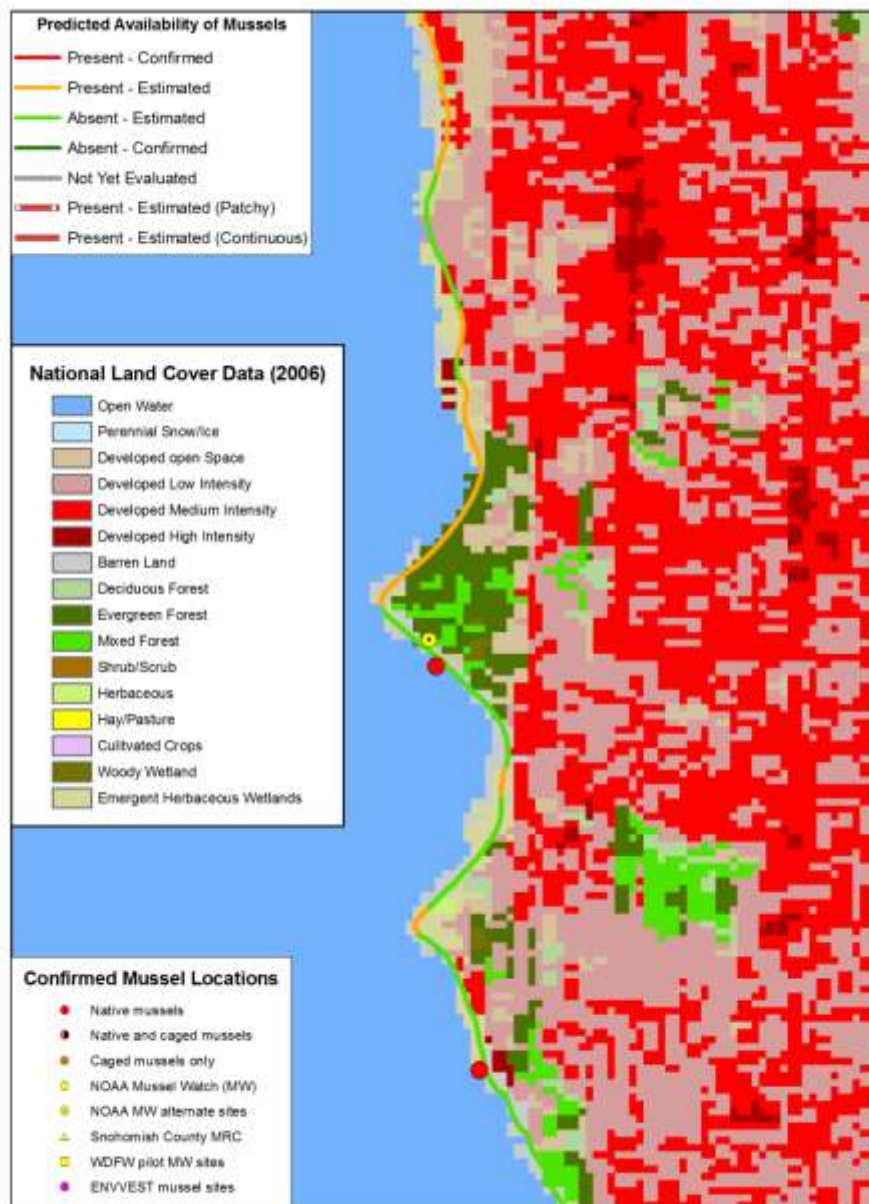
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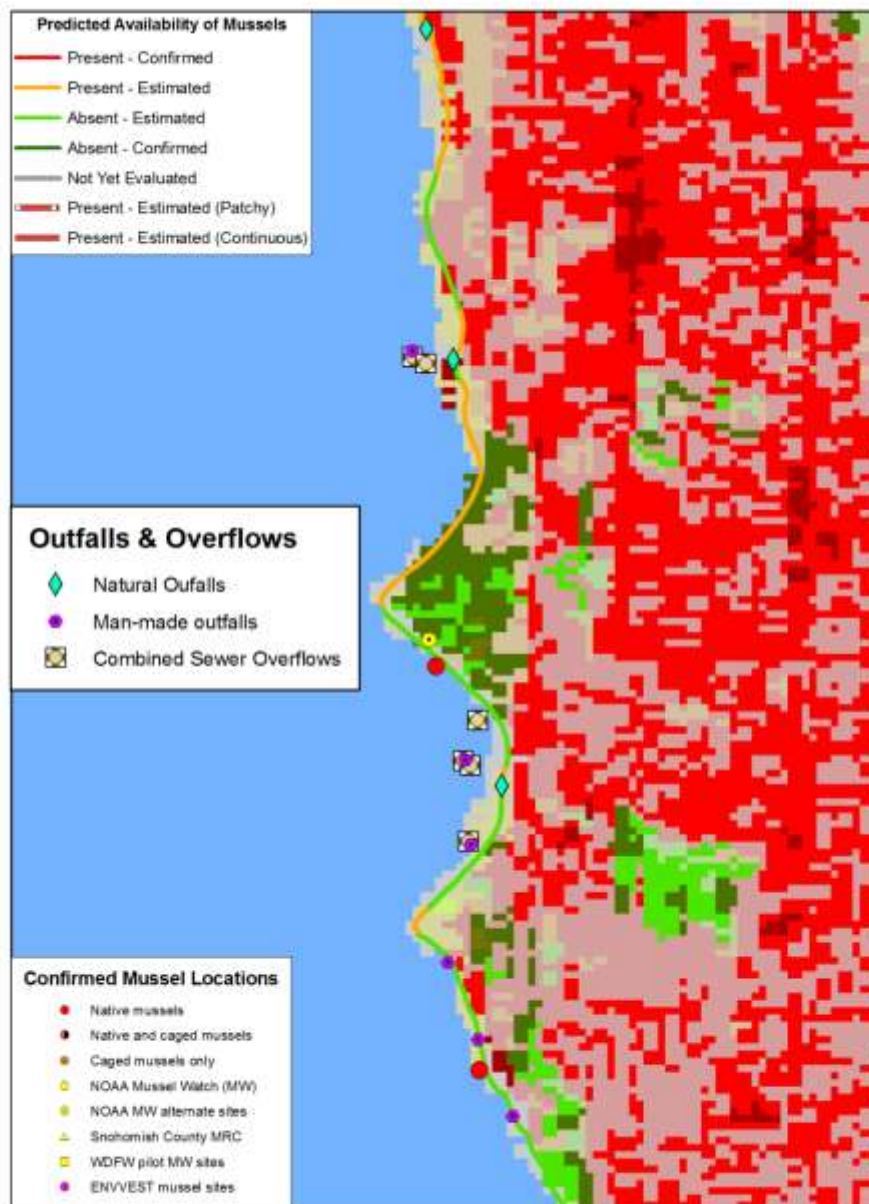- WDFW pilot MW sites
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Recommendations

- Re-evaluate the UGA/Rural question
- Use land cover and other factors to establish location classes (e.g., hi/med/low)
- Conduct pilot survey to evaluate range of contaminant exposures across classes
  - identify the "gradient" of conditions within UGAs
  - select gradients/locations to track